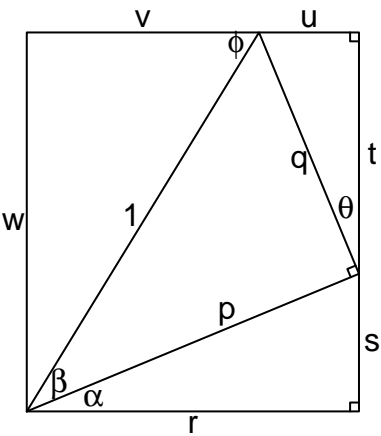


Question 1

In terms of  $\alpha$  and  $\beta$ , express all the lengths and other angle measures ( $\theta$  and  $\phi$ ).



| Variable   | Algebraic expression |
|------------|----------------------|
| $p =$      |                      |
| $q =$      |                      |
| $r =$      |                      |
| $s =$      |                      |
| $\theta =$ |                      |
| $t =$      |                      |
| $u =$      |                      |
| $\phi =$   |                      |
| $v =$      |                      |
| $w =$      |                      |

**Question 2**

The angle-sum and angle-difference identities are listed below:

$$\sin(\alpha \pm \beta) = \sin(\alpha) \cos(\beta) \pm \cos(\alpha) \sin(\beta)$$

$$\cos(\alpha \pm \beta) = \cos(\alpha) \cos(\beta) \mp \sin(\alpha) \sin(\beta)$$

You know the following:

$$\sin(210^\circ) = \frac{-1}{2}$$

$$\sin(45^\circ) = \frac{\sqrt{2}}{2}$$

$$\cos(210^\circ) = \frac{-\sqrt{3}}{2}$$

$$\cos(45^\circ) = \frac{\sqrt{2}}{2}$$

Determine  $\sin(-165^\circ)$  exactly.

**Question 3**

Prove the (sine) double-angle identity:  $\sin(2x) = 2 \sin(x) \cos(x)$

*(Hint: start with an angle-sum formula from Question 2.)*

**Question 4**

Prove the (cosine) double-angle identity:  $\cos(2x) = 2 \cos^2(x) - 1$

*(Hint: start with an angle-sum formula from Question 2. Also, you will need to use the Pythagorean Identity:  $\sin^2(x) + \cos^2(x) = 1$ )*

**Question 5**

Prove the (cosine) half-angle identity:  $\cos\left(\frac{y}{2}\right) = \pm\sqrt{\frac{1+\cos(y)}{2}}$ .

*(Hint: start with the double-angle identity from Question 4.)*

**Question 6**

Given  $\cos(44^\circ) \approx 0.72$ , what is  $\cos(22^\circ)$ ? Please set up an expression, but do **not** try to simplify or evaluate a decimal approximation.

*(Hint:  $44/2 = 22$ .)*